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CLINICAL HISTORY OF A CASE OF
RECURRENT DROPSY OF THE
LEFT MIDDLE EAR,

COMPLICATED, AFTER EIGHT YEARS' DURATION, BY AN ACUTE
ATTACK OF MONOCULAR OPTIC NEURITIS (CHOKED DISK) ON THE
SAME SIDE, FOLLOWED BY GENERAL TABETIC SYMPTOMS.

WITH REMARKS.

BY



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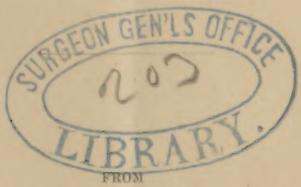
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From Charles A. Oliver

CLINICAL HISTORY OF A CASE OF RECURRENT DROPSY OF THE LEFT MIDDLE EAR,

COMPLICATED, AFTER EIGHT YEARS' DURATION, BY AN ACUTE ATTACK
OF MONOCULAR OPTIC NEURITIS (CHOKED-DISK¹) ON THE SAME
SIDE, FOLLOWED BY GENERAL TABETIC SYMPTOMS.

WITH REMARKS.

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WE have been induced to publish this yet unfinished case, not only on account of its great rarity, but also to make attempts to give answers to the curious and almost anomalous chain of interesting symptoms which have presented themselves from time to time during its study. We are fully aware that all we can say is purely hypothetical, and that the true response to our questionings can be obtained only by actual post-mortem examination; but by the process of exclusion, through careful and repeated clinical research, we think we have arrived at certain data which make the clinical features of sufficient importance to study until that time when nature shall furnish us with an absolute answer.

HISTORY OF AURAL SYMPTOMS.

BY DR. BURNETT.

July 8, 1874. Jacob R. Yeager, aged fifty-five years, a furnace-maker, single, of a lean and rather sallow appearance, makes the following statement: "At the age of eight years operated upon at the Pennsylvania Hospital by Dr. McClellan for a polypus in his right ear. After considerable cutting and cauterizing, the polypus disappeared. Since that time there has never been any hearing in the right ear."

¹ I use the term "choked-disk" to signify a choking of the intra-ocular tip of the optic nerve by serous extravasation into its subvaginal space. (Dr. Oliver.)

Inspection of this ear reveals a very shallow external auditory canal not more than two-thirds of the normal depth, at the bottom of which is no sign of a membrana tympani, but simply movable integument over bone. A paracentesis knife or a needle run through the fundus of the auditory canal until it strikes bone causes no pain. The integument in the place of the drum-membrane moves under the pneumatic speculum of Sigele. There are no traces of any ossicles of hearing. The tuning-fork, vibrating on the vertex, is heard better in the right ear than in the left, and the patient feels air enter the right tympanum, when he inflates the Eustachian tube, by Valsalva's method. It seems probable that the old cauterization in this auditory canal for the cure of a polypus stimulated excessive granulations, which, becoming organized, were allowed to close up the auditory canal and obliterate this ear. It may also be inferred that in this man there is a tendency to aural disease, probably of a catarrhal nature. His health is good; he is a strong man, and has been a hard worker in his trade all his life. The patient applies now, however, for relief from hardness of hearing in his good ear, the left. The membrana tympani on this side is opaque, lustreless, white, and flat, although the malleus is retracted.

Hearing for the watch $\frac{4 \text{ in.}}{60 \text{ ft.}}$. Politzer's inflator makes no impression

on the ear, but the catheter increases the hearing to $\frac{15 \text{ in.}}{60 \text{ ft.}}$. This, however, is not a permanent relief, as the patient states on July 20. He has been catheterized before by another surgeon, but with the same result, viz., improvement for a few days; then recession of hearing.

31st. The improvement gained by the catheter at last visit, four days previous, remains. Hearing for large watch, on left side, $\frac{15 \text{ in.}}{60 \text{ ft.}}$.

August 3. The hearing at this visit $\frac{4 \text{ in.}}{60 \text{ ft.}}$ for the watch. Immediately after catheterizing $\frac{3 \text{ ft.}}{60 \text{ ft.}}$ for the watch.

Sept. 12. Patient complains that there is a "drop of movable fluid" in his left ear. In a reclining position, the hearing becomes suddenly better (two feet for the watch), but when the head is in an upright posture the hearing sinks again (two inches for the watch). This was verified by me, by testing with a watch. Though no bubbles could be detected through the membrana tympani, paracentesis was performed in the lower posterior quadrant, and there escaped a brownish-yellow, transparent fluid when the patient inflated by Valsalva's method. No pain from the operation. Hearing now rose to $\frac{15 \text{ ft.}}{60 \text{ ft.}}$ for the watch; a better hearing than the patient has had for many months.

14th. The patient says that the sensation of the fluid "drop" in his ear has not returned, and in his opinion his hearing is normal.

Jan. 1, 1875. Patient calls to say that his hearing has continued to be good.

March 14. The patient now called to say that he felt the "old drop of fluid" in his ear, and he wished me to perform the paracentesis again. The hearing had sunk again to a few inches for the watch, and the drum-membrane looked flat and white, as it had done before the first paracentesis.

Paracentesis was now performed for a *second* time at the same point in the drum-membrane. Upon Valsalva's inflation, the same yellowish-brown fluid escaped from the opening and ran out at the meatus in quantity, ten to twelve drops. This gave the same relief to the hearing as the first operation. After the incision into the membrane, the latter assumed a bluish tint, and was thrown into delicate radiate rugæ.

23d. The incised spot healed quickly in a few hours on the 14th instant, as he ceased to be able to blow air through it by Valsalva's operation; and to-day his ear feels dull, and he desires the membrana tympani incised again. The membrane looks flat and pale. Paracentesis being again performed makes the *third* operation; there escaped the same kind of fluid from the drum-cavity. This gave the usual relief to hearing. The nares and fauces gave evidence at this time of some catarrh. Patient has cold in his head. He is told to come back as soon as his ear begins to fill up again.

April 15. The ear again feeling closed up, the patient presents himself for another operation. Paracentesis for the *fourth* time is performed in the same spot of the drum-membrane, and there escapes the same transparent fluid, perhaps a little deeper in colour this time, with the same relief to hearing.

May 8. Patient states that his ear is again deaf. He cannot relieve it by self-inflation; nor has he ever been able to do it. A *fifth* paracentesis is performed with the same results as heretofore.

19th. The ear continues free from deafness, but as patient thinks he can feel some fluid accumulating, the *sixth* paracentesis is performed, but no fluid escapes. The membrana tympani heals in a few hours.

Sept. 7. The patient complains again of the same filling of his ear, paracentesis is performed for the *seventh* time, with the same escape of fluid as at previous operations.

Oct. 26. Again the same old aural symptoms necessitate the paracentesis for the *eighth* time, with the same results.

Nov. 24. A similar noting of symptoms in case-book, with a note of the *ninth* paracentesis.

Jan. 3, 1876. Again the aural symptoms, a *tenth* paracentesis, and the usual flow of transparent, yellow-brown fluid, and the return of hearing. There are no signs of naso-pharyngeal catarrh.¹

Feb. 19. Patient comes again with his ear "stopped up." He is in good health, and hopes to serve in the police force on Centennial Exhibition grounds. The membrana tympani preserves the same rather negative appearances, *i. e.*, not indicating presence of fluid behind it. Yet guided by a knowledge of its appearance on previous occasions when fluid was behind it, and also by the patient's feeling, paracentesis for the *eleventh* time is performed. A quantity smaller than usual of the same kind of pale, tea-coloured fluid escapes through the puncture in the drum-head by Valsalva's inflation, with perhaps less relief to the patient's sensations of the presence of fluid. This operation gave relief until March 28. On this occasion the membrana tympani showed a brownish-purple colour. The hearing had become dull, and the ear felt "stopped up." No form of inflation relieved the symptoms. A *twelfth* perforation of the membrana tympani, at the same place, the lower posterior quadrant, gave vent

¹ To this point I have described the case on pages 429-432 in my Treatise on the Ear, 1877, Philadelphia, 8vo. pp. 615.

to the usual kind of fluid, and effected a return of hearing. After the perforation and inflation, the membrane became more of a normal bluish-pearl colour.

April 8. There is a reaccumulation of fluid in the tympanic cavity. The patient feels at this time the movable drop of fluid in his ear. The *thirteenth* paracentesis is performed, followed by the escape of the same kind of fluid, and the usual relief to his hardness of hearing.

24th. A similar condition of the ear, the *fourteenth* paracentesis, and relief of symptoms.

May 17. A similar note, with a *fifteenth* paracentesis, and the same discharge and relief.

June 20. The same note, with a *sixteenth* operation.

Aug. 23. Similar note, with a *seventeenth* paracentesis. It should be stated that the patient is obliged to be out at night, and in all weathers as policeman at the centennial grounds.

Oct. 23. Same notes, with the *eighteenth* paracentesis, in the same spot; lower posterior quadrant of the drum-head.

Dec. 27. A similar note, and the *nineteenth* paracentesis.

Feb. 6, 1877. A similar note, and the *twentieth* paracentesis. There are no pharyngeal or nasal symptoms to account for the reaccumulation.

March 27. The same condition of the ear, and the *twenty-first* operation for relief is performed.

May 11. A similar note, and the *twenty-second* paracentesis is performed.

The patient was not seen for a long interval, not until January 25, 1878. He states that for four months past, his ear has been growing duller or "filling up," as he says, and that the sensation of distension has at last become painful. The membranous tympana reveals symptoms in no way different from those usually seen when the patient has presented himself for operation. The hearing is very much reduced; the voice being heard only a foot. I performed paracentesis, the *twenty-third* time, at the lower posterior quadrant, the same kind of brownish, tea-coloured transparent fluid escapes from the perforation thus made, and the relief to hearing is as great as ever—the voice being immediately heard normally. This shows that no organic change can have taken place in the conducting apparatus of the middle ear, though the origin of the fluid in the drum-cavity, remains yet obscure.

Feb. 25. The usual "filling up" has occurred again, and a paracentesis, the *twenty-fourth*, gives the usual results of discharge and relief.

July 26. A similar note, and the *twenty-fifth* operation, with relief.

Nov. 29. A similar condition of ear, and a *twenty-sixth* paracentesis, with the usual results.

June 5, 1879. An interval of six months elapses. The patient comes again with the ear "filled up." The *twenty-seventh* paracentesis is performed with the usual favourable results.

Sept. 26. Upon this occasion, bubbles were distinctly seen behind the lower half of the membranous tympani. These moved when the patient inflated by Valsalva's method, but his hearing was in no way relieved by the inflation. At this visit, the *twenty-eighth* paracentesis is performed; not so much fluid as usual escapes, but the hearing returns.

June 15, 1880. A similar note, the *twenty-ninth* operation, and the same results.

Sept. 3. A similar note, with the *thirtieth* paracentesis.

None of the operations have ever been more than simple punctures in the membrane, and have never given any pain.

5th, 1881. Only one recurrence of the symptoms, and only one paracentesis in this year. This made the *thirty-first* operation.

Nov. 6, 1882. The patient states at this time that his left eye has become dimmed in vision, and that his left ear is again stopped up. Paracentesis, the *thirty-second* in the lower hinder quadrant, failed to give relief, because, as I found out later, the fluid required for an exit a perforation in the upper posterior quadrant. Why, I am unable to say (see note of March 27, 1883). Upon this occasion, I sent him to Dr. Charles A. Oliver for ophthalmic examination, whose notes may be consulted for the results he obtained.

Dec. 14. The hearing is found to-day to be three feet for isolated words. The ear feels stopped up, but the membrana tympani looks smooth and fairly normal in colour. The *thirty-third* paracentesis is made, a rather opaque, yellowish fluid escapes, and the hearing thereafter is six feet for same tests as above named. The membrana tympani became very much retracted and thrown into rugæ, and bluish-white in colour, as on March 14, 1875.

Jan. 21, 1883. Patient again feels his ear stopped up. Is rather feeble this winter. The *thirty-fourth* paracentesis is made, and a slightly opaque, yellowish, thin fluid escapes, after which the hearing becomes relatively normal.

30th. A similar condition of ear again noted. The *thirty-fifth* paracentesis is performed, and a thin yellowish fluid escapes. The hearing is made better thereby, but it does not seem now to reach the same high point after the operations as some years ago. The paracentesis leaves no scar on the membrane. The latter heals in a few hours.

March 27. Patient complains that his ear is again "filled up." No bubbles seen behind membrane before paracentesis. The *thirty-sixth* operation is then performed. The membrane seems tougher than usual. Valsalva's inflation forces out a little frothy, brownish fluid, like the usual kind. By this inflation, bubbles are seen moving in the upper and hinder quadrant, but they do not escape through the perforation in the lower posterior quadrant. A second paracentesis was then made in the upper, posterior quadrant, and considerable pale, yellow, thin transparent fluid escaped. Patient says his eye and ear feel better. Hearing for words before the operation, eight inches; after operation, five feet.

In the operation of November 6th, and in that of March 27th, the paracentesis in the lower posterior quadrant did not seem to be adequate for the perfect drainage of the tympanic cavity. Hence in the operation of March 27th, a second puncture was made in upper, posterior quadrant where the bubbles were seen, which could not escape from the first and lower opening, and more fluid escaped from this second upper opening than from the first and lower one.

May 1. The patient complained of a stuffed feeling in his ear, and for the *thirty-seventh* time, the membrana tympani was perforated at the lower posterior quarter; but not a drop of fluid escaped, nor could the patient inflate the drum-cavity by Valsalva's method.

3d. The patient still complains of the stuffed feeling in his ear, and he says he cannot inflate by Valsalva's method. Paracentesis for the *thirty-eighth* time is performed, and a drop of grayish opaque fluid is forced out by Valsalva's method. The case seems to be changing in type, now

appearing to be more like an ordinary case of hypertrophic catarrh of the drum-cavity.

On June 6th, the symptoms of deafness being the same, without any evidence of fluid in the drum-cavity, the catheter was used for inflating the left Eustachian tube, since the patient was unable to inflate as he once could by Valsalva's method; but this gave no relief to his deafness or the sensation of fulness in the ear. The patient is evidently weaker; is dizzy when he stoops, and when he walks. The scar made by the perforation of May 3d is still very plainly visible, demonstrating the want of the quick reparative power always heretofore seen in this case.

Aug. 10. The hearing for voice is six inches, only in the left ear. Inflation by Politzer's method increases the hearing to several feet. The tuning-fork vibrating on the vertex is heard best in the right ear, and the voice in the right ear, when words are uttered close to it.

20th. The patient can again easily inflate his ears by Valsalva's method. His hearing is nearly relatively normal, *i. e.*, three or four feet for vocal sounds, and he has no further sensations of filling up of his ear with fluid, the occurrence of which he has learned to recognize. He is just as dizzy as ever, especially when he turns around suddenly. The direction of the turning makes no difference; he may stagger toward either side. Scar of last paracentesis still plainly visible, as a red, scab-like line on the manubrium, near the short process, where it has moved from the lower posterior quadrant of the drum-membrane. The membrana tympani moves easily and plainly under Valsalva's inflation.

Remarks.—There seems to have been a tendency to aural disease in this man, evinced in his childhood, as may be learned by reference to the notes, in which is recorded an account of the existence of a polypus and an operation for its removal, at the age of eight years. This operation obliterated the parts of the organ of hearing usually visible through the speculum, and has left nothing to compare with the other ear. Hence, all information thus ordinarily derivable by comparison of two ears is lost.

The nature of the disease in the left ear seems to be catarrhal, for, when exposed to influences of air and living, likely to provoke catarrhal symptoms, as in 1876, he was markedly worse, and was obliged to resort to frequent operations of paracentesis for relief. And earlier, at the time of the third paracentesis, he had a severe cold in his head. Then, too, his avocation, that of a furnace or stove-builder, would expose him to influences of heat and cold, likely to provoke a catarrh, and especially an aural catarrh. The frequent restorations of hearing by the operations and escape of fluid are worthy of note. They indicate that the disease lay chiefly in the mucous membrane of the tympanic cavity, and not in the underlying fibrous tissue of the ossicles. Gradually, as the fluid formed more slowly, and in less quantity, and as its escape gave less relief to deafness, it would seem that the mucous membrane had become thicker and drier, and that the case assumed the type of hypertrophic aural catarrh. Other coincidences in favour of the purely catarrhal nature of the ear-disease are that after a paracentesis on May 1, 1883, no fluid escaped from the tympanic cavity, though the ear felt stopped, auto-inflation of the Eustachian tube was im-

possible, and there was no relief to the hardness of hearing. These symptoms of a dry catarrh continued for a month, when the use of the catheter relieved the deafness and other catarrhal symptoms in the ear, but the vertiginous symptoms and the alteration in gait increased. I would say, here, that the only record of a case resembling this in the frequent reaccumulation of fluid in the drum-cavity after repeated paracentesis, is that given by Dr. J. Oscroft Tansley,¹ and called by him Hydro-tympanum.

It is worthy of note that the patient's sensations first drew attention to the fact that movable fluid was in his tympanic cavity. Bubbles were rarely seen in the course of eight years, and not at all until many operations had been performed on the membrana tympani. Before a paracentesis, when fluid was in the tympanic cavity, the membrane of the drum looked lighter in colour, flatter and smoother than after the paracentesis. It then assumed a darker hue, and appeared sometimes thrown into rugae. If the fluid were allowed to remain some time after it had accumulated, it gave rise to a sense of distension and pain in the ear. After such long retentions, rugæ were most likely to appear. The paracenteses never made a permanent scar on the membrane until the thirty-seventh or thirty-eighth operation. Then, with an apparent change in type in the ear-disease, the reparative power of the membrane seemed impaired to an extent which seemed to make the disappearance of the scar slow; but the drum closed as quickly as ever.

The colour of the fluid which escaped from the drum-cavity after the various paracenteses resembled that seen by me in other cases of undoubted closure of the Eustachian tube, in which Valsalva's form of auto-inflation was impossible. As in this case, Valsalva's inflation was usually very easily performed, and as there was every evidence that the fluid in the drum-cavity never escaped by the Eustachian tube into the fauces, the thought naturally suggests itself that in this man's Eustachian tube there must have been a valve-like fold of mucous membrane or a small gland or follicle, extending across the calibre of the tube, and acting like a valve, opening only towards the tympanum, thus permitting *air* to enter the cavity, but preventing the escape of fluid from it in an opposite direction towards the fauces.

The tuning-fork vibrating on the vertex was heard best in the right ear, because, as has been shown, it was more obstructed than the left ear, in its external auditory canal and tympanum, by organized granulation-tissue. This phenomenon, therefore, cannot be adduced in proof that the disease in the left ear is central in origin. In fact, the gradual improvement of late, and the now relatively normal condition in all respects of the left ear, in a subject presenting an increase in vertigo and alterations in gait, tend to dissociate the aural from the latter symptoms. The latter, rather than being ascribable to ear-disease, seem to be tabetic in origin.

¹ Archives of Clinical Surgery, 1878, p. 63.

OPHTHALMIC AND TABETIC SYMPTOMS.

BY DR. OLIVER.

On the 6th of November, 1882, I received a note from Dr. Charles H. Burnett, asking me to examine Mr. Yeager's eyes. The patient, a very intelligent man, gave me the following history: He had been wearing glasses for near-work for ten or fifteen years; had had several changes; last pair for four years, never having had any trouble with them. Never any ocular pain or headache. Three days previous, he accidentally discovered that he was unable to see with his left eye: sure that he never had any trouble with this eye before; in fact, he always considered it as good and as useful as the other. Upon examination, I found the conjunctival mucous membranes pallid. Commencing arcus senilis. An irregular, almost central, superficial nebula in the left cornea. Slight shallowing of the anterior chamber of the same eye. Irides light-blue, and freely mobile. Both pupils normal in size and shape. Tn. O. D. V. = $\frac{6}{xxiv}$.

With S. 1 D. V. = $\frac{6}{vi}$. With S. 3 D. read Sn. 0.5 D. from thirty-five centimetres to fifty-six centimetres. O. S. Light¹ perception in all parts of the visual field; vision dazzling, and reminded him of innumerable yellowish points on a blue ground. No obtainable accommodation.

Ophthalmoscopic examinations showed in right eye: Media clear. Disk irregularly round, about seven diameters in apparent size. Exceedingly dirty red-gray in tint—not excavated or prominent. Scleral ring visible both in and out, although probably continuous around the entire disk, being hidden at the superior and inferior edges by coarse retinal striation. Trace of conus to the nasal side of the disk beyond the scleral ring; whilst to the lower temporal margin of the disk there was a long black pigment massing. Retinal arteries and veins normal in proportionate size, calibre, and colour. No visible splotches or hemorrhages. H. between 1 and 2 D. The ophthalmoscopic examination of the left eye, made by the aid of an instillation of the one-fortieth of a grain of hydrobromate of homatropine, causing even an almost full pupillary dilatation, revealed a far different picture. Region of disk exceedingly swollen, the summit being about 2 D. in advance of the normal portion of the retinal plane, which was equivalent to about 1 to 2 D. The sides of the swelling gradually and evenly sloped in all directions to the irregularly swollen retina; its general outline vertical oval, about eight by ten diameters in size, and its colour almost identical with that of the other eye. The edges of the disk nowhere visible; their position being judged by the situation of the retinal vessels and swollen tissue. Entrance of vessels invisible, being concealed in the substance of the swelling. The principal upper and lower venous trunks enlarged and tortuous, dipping into the swollen retina; several tissues losing themselves by short, deep curves, before regaining their normal calibre and proper course, about twelve to fifteen millimetres beyond the summit of the swelling, where the retina assumed its proper level. Arteries first seen at the base of the swelling as very contracted, tortuous, blood-bearing streaks accompanied in many instances by opaci-

¹ Diffuse reflected sunlight of sufficient power to give $\frac{6}{iv}$ vision for form.

ties of their lymph-sheaths. Numerous feathery masses of fresh hemorrhagic extravasation in the fibre layer of the retina, especially following the vascular distribution. In the primary bifurcation of the upper temporal division of the central retinal vein, there was a long flame-shaped hemorrhage. Immediately in the macular region could be seen a large irregular hemorrhagic mass, seemingly completely surrounding the fovea, but yet the annular yellowish reflex of the rim of the macula could still be vaguely seen. No visible choroidal changes. Media clear, with the exception of the cornea.

Upon further questioning him, I found that for the past year he had been making a great deal of water, especially at night. By indirect questions, no history of syphilis could be gotten: the patient did not present any external evidences of it. Never had been seriously sick, or suffered any injury. Never used tobacco, or stimulants of any kind. Family history good.

Central colour-perception taken at a distance of five metres.¹

O. D.

Red	first seen at four millimetres exposure.
Green	Seen as blue at ten mm.
	Green at twenty mm.
Violet	Reddish at twelve mm.
	Pink at twenty-eight mm.
Blue	Violet at forty-nine mm.
	Seen as green at fifteen mm.
	Blue at thirty-two mm.

O. S.

Unable to see anything but candle-light;
appearing as a dull diffuse, sometimes brilliant yellowish body.

Thus approximately giving in the right eye a central colour-sense power, at five metres distance, of one-half vision each for red, green, and violet; and one-fourth for blue.²

The amount of colour-vision in the left eye could not be obtained, as it was reduced to a mere sensation of yellowish light.

Fields of vision were now accurately taken.³ That of the right eye for form, white, blue and red were found slightly but equally contracted in the order given. No indentations (except that caused by the patient's prominent nasal bridge) or interruptions found, although carefully looked for. In the left eye, with candle-light fixation, light perception obtained by the motion of a second candle-light, was equal in all meridians except to the extreme temporal and nasal sides in the horizontal meridian, where, in sectors each of about thirty degrees, the movable light faded and became nearly lost. No scotomata. With his right eye, he matched Holmgren's skeins of worsted correctly, but slow in determination: With his left eye, the different colours appeared as mere shadings and gradings of "dirty-grays."

¹ For description of instrument used, see Archives of Ophth., vol. x. No. 4, December, 1881.

² See method of experiments by the writer for the determination of a normal standard of colour-sense in the Archives of Ophthalmology, vol. xi. No. 1, March, 1882.

³ One centimetre square each of unglazed white, blue, and red paper pasted on slips of dead-black cardboard, were carried inwards towards the fixation point, situated thirty centimetres' distance from the eye.

I had him return, on the following day, with a specimen of his early morning's urine. This I found to be amber-coloured, transparent, with no sediment; specific gravity 1018; acid reaction; no albumen or sugar. Microscopically; no tube-casts of any description, although several slides were successively ploughed over and over, merely showing a few oxalate of lime crystals. I then ordered for him two pairs of convex spherical lenses. 1 D. for distance, and 3 D. for near work. No general treatment. To report at stated intervals, so that I might watch and study the passing symptoms.

Dec. 14. Returned, saying that the sight of his left eye had been gradually increasing for the past two weeks, but curiously, he noticed at the same time, that his left ear began to feel full, and hearing had been proportionately deteriorating. His expression, "the water has left my eye, and gone back to my ear," was very emphatic. It had become so bad that he had visited Dr. Burnett early in the morning, and had had paracentesis of the left tympanic membrane performed, evacuating a quantity of fluid.¹ The appearance of the blue field studded with brilliant points also ceased about two weeks ago. Had had a great deal of dizziness. Vision and accommodation of the right eye the same. O. S. V.=

$\frac{6}{Lx}$ (centric): With S. 1 D. V.= $\frac{6}{xxx}$ (centric): With S. 3 D., Sn. 0.50

not read, but clearest from forty-five centimetres to fifty centimetres.

Urine re-examined; amber colour and transparent. Sp. gr. 1017. Chemically: Acid reaction; no albumen or sugar. Microscopically: A few oxalate of lime crystals; no animal debris with the exception of a few epithelial scales.

Thirty minutes after tapping of left drum-head, ophthalmoscope showed (without the use of a mydriatic) that the nerve of the right eye had still the same dirty red-gray appearance. In the left eye (pupil partially dilated by homatropine), the edges of the disk were everywhere visible; showing a well-marked scleral ring all around. Disk itself irregularly oval, seven by eight diameters, long axis about one hundred degrees. Exceedingly dirty red-gray in appearance and on the same general level as the fundus; although a few of its most prominent vessels were one-half dioptre in advance. Choroidal ring to the nasal side. Retinal arteries diminished in calibre. About two disks' diameter below the disk there were some small irregular blood masses in the fibre-layers of the retina, in close proximity to the lower retinal vein. The large irregular flame-shaped hemorrhage situated in the primary bifurcation of the upper temporal vein was still *in situ*, although less plainly marked, as it was undergoing absorption, especially at its edges. On the upper side of the lower outer branch of the lower temporal artery, there was a small absorbing hemorrhage. Macular region occupied by a grouping of irregular yellowish-brown bodies, each about the size of a pin's head, looking like partially absorbed hemorrhages undergoing fatty degeneration. Fovea still dimly seen. About a disk's diameter to the temporal side of the macular region, there were two large irregular hemorrhagic extravasations (not fresh) each about one-sixth the size of the disk; whilst about a disk's diameter beneath these, there were several small absorbing masses.

¹ See note in Aural Report.

Central colour-perception (with S. 1 D.) at five metres.

	O. S. ¹	O. D.
Red	Very dark spot of fire at twelve mm. exposure.	
	Pink tinge at thirty-seven mm.	Red first seen at five mm. exposure.
	Pink at forty-eight mm.	
Green	Deep pink, sixty-seven to ninety mm.	
	Spark of fire at six mm.	Green { Light-blue at sixteen mm.
	Sky-blue, sixty to ninety mm.	Green { Green at fifty-three mm.
Violet	Dark spot of fire at twenty-one mm.	
	Dark pink with a yellowish cast ² at ninety mm.	Violet { Reddish at six mm.
	Blue spark of fire at twelve mm.	Violet { Violet at twenty-three mm.
Blue	Blue cast at fifty-five mm.	Blue { Green at eleven mm.
	Dark blue, eighty-four to ninety mm.	Blue { Dark green at eighteen mm.
		Blue { Blue at twenty-nine mm.

Both "patellar-tendon" reflexes exaggerated; but more markedly so on left side. The kick was readily produced by gentle percussion on the belly of the muscle.³

Dec. 15. Visual fields of right eye taken, and found to be about the same as at last examination.

18th. Physical exploration gave absence of any pulmonary, cardiac, or hepatic trouble. Radial pulses, eighty-four. Ophthalmoscope showed same condition of left optic nerve and retina as at last visit. Macular region of right eye intact.

Visual fields of the left eye were now obtainable, and, being carefully taken, gave some interesting results: One centimetre square of white, first seen in all directions from sixteen to twenty degrees from fixation point. Same size blue seen at fixation point, and extending out as a good blue about five to eight degrees in all meridians, and then becoming lighter and lighter until lost at about twelve to sixteen degrees. One centimetre square of yellow, first seen as yellow in all directions from fixation point, for from six to eight degrees: Whilst red (invariably called light pink), seen only from two and a half to five degrees in all directions from fixation. The general outline of all these fields being vertical ellipses, the macular fixation being situated at the bisection of the two principal foci. No scotomata or interruptions.

Jan. 2, 1883. O. S. S. 1 D. V. = $\frac{6}{XXIV}$. Patient asserted that for the

past week his left ear had been getting deaf. Thinking that some light might be thrown upon the case, I determined to examine the condition and power of the optic nerve immediately before and after paracentesis; but no observable changes could be seen, or any loss or gain in vision for form or colour could be made out. I found the edges of the left disk every-

¹ Tried diseased eye first, telling patient I had a new card of colour, thus endeavouring through want of previous knowledge to obtain more accurate results.

² See Archives of Ophthalmology, vol. xi. p. 69.

³ The belly-tap kick, I think, is a fair indication of exaggeration of the reflex.

where visible, and the retinal hemorrhages undergoing absorption; the flame-shaped one presenting a granular appearance. The macular extravasation was still to be seen, but not so marked as at last examination.

16th. O.S. V. = $\frac{6}{LX}$: S. 1 D. V. = $\frac{6}{XXIV}$? : S. 3 D. Sn. 1.25 clearest

(not read) at about thirty-seven centimetres. Ophthalmoscope showed the disk's edges everywhere visible. Retinal hemorrhages fast absorbing. Disk presenting a "filled-in" appearance.

30th. O.D. vision and accommodation the same. O.S. S. 1 D. V. = $\frac{6}{XIX}$: S. 3 D. Sn. 1.25 clearest (not read) at about thirty-seven centimetres (before and after tapping). Ophthalmoscope showed both of the nerves in the same condition as at last visit (before and after tapping). Complained of two attacks of twitching of the facial muscle of the left side, each lasting for four or five minutes.

Feb. 13. Vision of left eye with S. 1 D. = $\frac{6}{XV}$. Able to spell words of Sn. 125 with S. 3 D. at fifteen centimetres.

27th. O.S. eye-ground much clearer; no new changes. The extravasations fast disappearing. At this time, form-vision of left eye reached $\frac{6}{XII}$? Accommodation about the same as at last visit.

March 13. Vision of left eye again failing; S. 1 D. V. = $\frac{6}{XIX}$. Accommodation about the same. Eye-grounds still appear the same. R. Collyr. acidi boracici gr. xvij ad f $\frac{3}{2}$ j, for slight attack of catarrhal conjunctivitis.

27th. O.S. S. 1 D. V. = $\frac{6}{XIX}$: With S. 3 D. Sn. 0.50 clearest (not read) from twenty-eight centimetres to forty-eight centimetres. Eye-grounds the same as at last visit.

April 10. Vision and nerves of left eye the same. "Patellar-tendon" reflex still increased on left side, but the exaggeration in both contractions not so marked as during previous examination. Opportunity now presented itself by which I was able not only to obtain an accurate record of the exact amount of colour-blindness of the left eye during its post-neuritic stage, that is, its passage into atrophy; but to actually preserve and permanently keep examples of the colour-changes for future comparison, both for myself and all those who are interested in the subject. This I did by means of a Radde's colour-scale.¹ In number one test (green) of Holmgren; with his left eye he matched two wools equivalent to letter r of

¹ Published by the "Société Sténochromique," of Paris. It consists of a long quadrangular piece of muslin upon which are forty-four strips of cardboard pasted side by side. The first strip has the so-called "index" on it—a vertical row of thirty-one "rainbow-colours," commencing with cinnabar and terminating with carmine, followed by eleven more strips, these latter being examples of the principal colours mixed with gray, each colour being numbered. The next strip has the verbal expression of each index-colour situated on a level with the colour itself. Now follow forty-two strips, each having an index-colour about the middle of the strip, from which twenty lettered shades and tones successively rise and fall, so that by the time the end of the table is reached, we will have had over eight hundred and fifty colours, each graded and registered in its proper place.

number five strip, and letter q of number thirty-two strip of the scale. Letter r of number thirty-five of the scale was the exact equivalent of the wool selected as being the nearest match to the rose tint; whilst letter q of number twenty was the counterpart of the wool chosen in the number three or control test. I tested still further for confirmation, and found that the letter i of number twenty was the colour of the wool chosen as nearest to pure blue (letter i of nineteen). Yellow vision was good.¹ No evidence of any colour-blindness found in the right eye, even after repeated examination.²

May 1. Vision of both eyes same as at last visit. Ophthalmoscope showed that the left nerve was becoming grayer. Retinal arteries and veins as before. Von Graefe's tapping-test gave negative results. No cranial bruit heard. Left "patellar-tendon" reflex was still increased, although reflex diminishing.

15th. Complained of a heavy pressure in frontal region, there being no difference in its intensity on either side. Said he had been getting dizzy when he walked, whilst eyes were closed. Left "patellar-tendon" reflex still the greater, but both diminished. O.D. S. 1 D. V. $\frac{3}{\sqrt{1}}$ O.S. S. 1

D. V. $\frac{6}{\sqrt{1}}$. Asserted that taste was perfectly good, but that smell was not. This he had noticed for the past twenty years, dependent, he thought, upon his left nostril not being so free. No subjective sensations of smell. I tested him, and found smell deficient with his left nostril, although canals perfectly free, and mucous membranes identical. Patient able to eject air through his two nostrils with equal force against his hand. Ophthalmoscopic examination of the left eye showed that its disk's edges were everywhere visible. Commencing excavation. Merely few pigment stains where previous hemorrhages existed. No new extravasations. No change in calibre of bloodvessels or colour of current from that of last examination.

31st. Such marked changes had occurred in the left eye that I instilled the one-fortieth of a grain of hydrobromate of homatropine for more extended examination. Ophthalmoscope showed that the disk was deeply excavated into the lamina cribrosa, the excavation being large, and shelving almost directly up to scleral ring. Retinal arteries and veins were diminished in calibre, both in proportion to their previous condition, and the coexistent size of the retinal vessels of the other eye, especially the arteries, which were being rapidly reduced to mere threads. Colour of the venous current more nearly normal, with less tapering of vessel walls as they entered the optic nerve. Nerve itself had a comparatively grayer hue, and was less capillary than its fellow. The hemorrhage in the pri-

¹ The use of Radde's scale in this connection was first hinted at by Geissler in "Schmidt's Jahrb.,," Bd. 191, s. 92, but, as far as the writer knows, no attempts to methodize its employment have ever been made.

² It may be worth while noting that after the writer had selected the proper strip in Radde's scale to place the chosen colour in, the patient himself was made the one to compare the selected wool with the nearest changes, he being more able, by reason of his acquired power of differentiating shades, to give the exact intensity, and hence the proper letter.

³ Sharply tapping the cranial vault with the finger : Von Gräfe asserted that the position of a cerebral tumour may sometimes be ascertained by this method : the tap causing acute pain at the point of the morbid growth. "Kl. Monatsbl." 1863, s. 3.

mary bifurcation of the upper temporal vein was entirely absorbed, allowing clear retina to be seen; but the upper macular branch had some pigment degeneration situated near it, in the position of the previous extravasation. All traces of smaller hemorrhages in the inferior portion of the retina had disappeared. The lower edge of the rim of the fovea centralis was still seen as a crescent, but in and above it were some unabsorbed masses, near a small macular twig of the lower temporal vein.

Quinine tasted the same on both halves of the posterior portion of the dorsal surface of the tongue. Ether and iodoform more plainly smelt with right nostril. Egress of expulsed air equally free on both sides. Radial and carotid pulses equal in volume, strength, and rapidity (eighty beats per minute, comparatively full and strong for time of life). O.S. 1 D.

V. — $\frac{6}{\text{XXX}}$.

June 14. O.D. S.1 D.V. = $\frac{6}{\text{VI}}$. O.S. S.1 D.V. = $\frac{6}{\text{XXX}}$. Visual

fields again taken. Those of the right eye were somewhat concentrically contracted; the red field being about two-thirds its previous size. Those of the left, although continuing of the same general form, were only about two-thirds their former size. Red still called pink, but curiously only so at the periphery: The patient persisted that the colour became a "dirty-brown" when it had reached fixation point. Amount of colour-blindness obtained by means of the wools and scale gave the following results: With right eye wools sorted and matched correctly. In the green test, with left eye, he matched a skein equivalent to letter n of number twenty-two strip. In the rose test, letter n of number four strip. In the control test, letter q of number twenty-four. For the nearest to blue, he selected a wool corresponding to i of nineteen; whilst with yellow v of number forty-two was the match.

Central colour-perception at five metres.

	O. S.	O. D.
Red	{ "Light pink fire" at thirty-two mm. exposure. Darker at fifty-four mm.	Red first seen at five mm. exposure.
Green	{ "Lead colour" at ninety mm. Dark spark of fire at fourteen mm. Brighter at twenty-five mm. Lighter and brighter, forty-eight to ninety.	Green { Blue at six mm. Green at forty-two mm.
Violet	Yellow spark of fire at twenty-six mm. Lilac, eighty-four to ninety mm.	Violet { Yellow at six mm. Violet at thirty-six mm.
Blue	Dull spot of fire at thirty-two mm. Brighter, fifty-five to ninety mm. Bright blaze of fire at twelve mm.	Blue { Green at twelve mm. Blue at forty-two min.
Yellow	Brighter at twenty-two mm. Brighter with a blue tinge at forty-four mm. Blue tinge gone, very pale lemon colour, at seventy-two to ninety mm.	Yellow first seen as yellow at twenty-five mm.

28th. O.D. S. 1 D. V. = $\frac{6}{VII}$. S. 3 D. showed a slight increase in presbyopia, "ρ" being removed about three inches. O.S. S. 1 D. V. = $\frac{6}{XXX}??$.

Left "patellar-tendon" reflex still the more.

July 12. Vision remained the same. Said that he had not had any twitching of the muscles of the face. Voluntarily told me that he had lately noticed a tendency to stumble sideways whilst walking, and that his left knee gave out upon going up stairs. Tendency to sleep. No headache or neuralgia of any kind. No trouble with water. Bowels regular. "Patellar-tendon" reflex on the left side still the more. I spent some time making comparative asthesiometric experiments, both with blunt and sharp points, in order to see if tactile sensibility was lowered or changed; but, after the most prolonged examination with careful and conscientious endeavours on the part of both the patient and myself, I could not get any departure from what I supposed ought to be considered normal. Contact in relative positions and directions in many places on the two sides of the head, trunk, and limbs failed to show any unilateral derangement of sensibility.

26th. Complained still more of the tendency to stumble sideways, compelling him to throw the other foot to the same side, to keep himself from falling. Asserted that he had "a weight on the top of head," and that he was more disposed to giddiness. No twitching in any muscle. No shooting pains. Said that he continually felt as if he was "walking on something soft," and that he "can't feel tread so much;" although "no difference in the two sides." Gets "tired in walking." Knows "that sight in left eye is failing." Tendency to sleep and drowsiness. Left knee gives way when he attempts to go up and down stairs. Examination showed me that the vision of his eyes remained about the same. Left "patellar-tendon" reflex the more. Incoördination of the lower limbs tested by making him walk in a straight line, without looking at the floor; showing a tendency to throw himself towards the right, when the right foot was being planted, and towards the left when the left foot was being placed on the floor. Said that there was a slight tendency to reel and fall, when I made him attempt to balance the body whilst he was standing erect, with his eyes shut; although to all appearances he stood perfectly still. Muscles of limbs equally developed and well nourished for time of life. Spine not tender to pressure. No history of spontaneous pain in that region. Testing of a few of the superficial reflexes gave me entire absence. Plantar reflexes not tried; cremasteric showed want of testicular contraction; no obtainable contraction, not even stiffening or rigidity of the abdominal, gluteal, and epigastric muscles.

Aug. 9. Still had the subjective sensation of "treading on something soft." Dizziness remained; but he really felt better than at last visit. Vision the same. Pupils normal in size and shape. Irides equally responsive, separately or combined, to both light stimulus and the accommodative act. I instilled the one-fortieth of a grain of sulphate of daturia into the left conjunctival sac, so that I might obtain an accurate ophthalmoscopic view. The disk still presented the same dirty red-gray appearance; the grayness being more marked in the deeper layers. Arteries, veins, and excavation same as at last examinations. All traces of splotches and hemorrhages disappeared. Macular region slightly granular and

irregular. Disk of the right eye dirtier and grayer, although by no means so atrophic as its fellow.

20th. Bright day. Excellent vision for the right eye; reading on a new card, every letter of six dioptric type at six metres distance. Vision of left eye gotten with the same card, at the same distance, showed a haphazard guess at number forty-eight dioptric type. Action of irides as at last visit. Weight on top of head persisted, and ground still felt soft under his feet. "Patellar-tendon" reflexes less than ever, yet the same relative difference existed. Said that he had ceased all sexual desire some five or six years ago.

27th. Vision of right eye the same as at last visit. That of the left had fallen to one-tenth of normal ($\frac{6}{LX}$). I sent him to my friend, Dr. G.

Betton Massey, to see whether there were any discoverable motor derangements. The following is the report: "Muscles of expression of right side of face deficient in motility. Is unable to squint or grin on that side (the patient dates this from the time of the removal of a polypus from the right ear). The grip of both hands is good: Dynamometer, R. 115, L. 115. Has all motion of arms and legs with no apparent diminution of force. Electrical condition of muscles and motor nerves: Face-response to F. C. equally good on both sides. All other muscles and nerves responded well to faradic current, except peroneal nerves, which showed slight diminution on both sides. Galvanic current; normal reaction.—Ka. S. Z. An. S. z.—present in muscles and nerve, which also showed a normal degree of quantitative action.

Remarks.—The want of motility in conjunction with the presence of a good response to faradism, and no degenerative reaction on the right side of face, would at first glance point to centric trouble, but I think this must be excluded when we take into consideration the patient's assertion of the simultaneous occurrence of the stiffness of the right face with the removal of the polypus. Such traumatic cause for the unilateral palsy would naturally suggest a diminution in the faradic response and other evidences of degenerative reaction. Yet such is by no means necessarily the case. An interference with the electrical reactions only occurs in those cases of peripheral palsy where the traumatic cause is of a nature sufficient to impede the proper conduction of trophic influence. Where traumatism falls short of such a degree, the motility may be diminished without change in electrical reactions.

The slight lessening to F. C. in the perineal nerves is not so easily explained; but the absence of degenerative reaction in this situation undoubtedly excludes a peripheral cause."

29th. Again tested colour-blindness. Wools correctly matched with the right eye. In the green test with the left eye, letter t of number seven was the selected equivalent; letter m of number thirty-two was the match in the rose test; letter l of number fourteen was that of the control test; letter u of number forty that of the blue; letter m of number nine that of the yellow.

At this point Dr. Burnett and I agreed to close the case, as we both thought that we had sufficient data to establish a fair and probable solution of the trouble; reserving the later changes for a future paper in which a final report could be embodied with the post-mortem examination, thus showing how much dependence can be placed on the significance of pass-

ing symptoms in the diagnosis of some of the rarer forms of grave and insidious nerve disease.¹

Remarks.—Before going into the discussion of the possibility of any connection between these curious series of phenomena, it will be of value to point out the meaning of a few of the ocular and other changes I have observed during my study of the disease.

Onset and type of the choking of the disk.—It will be remembered that it was sudden and that it was purely unilateral. Upon carefully going over the literature of optic neuritis dependent upon intra-cranial change, excluding orbital disease, external injury,² true fracture, etc., as a cause, I find comparatively few of the unioocular type. Study of the combined cases reported by Annuske³ and Reich⁴ gives less than seven per cent. of the unilateral form. Gowers, on page 130 of his *Medical Ophthalmoscopy*,⁵ says: “The neuritis of tumours is in most cases double, sometimes equally advanced in the two eyes, often more intense and subsiding earlier in one than in the other. Rarely the affection of the disks is unilateral . . .” Further on⁶ he gives the clinical history of a case of unilateral optic neuritis, and thinks it was as “in most cases in which it is unilateral, on the side opposite to the cerebral lesion.” Von Graefe⁷ mentions a case of brain tumour with unioocular choked disk. Dr. J. Hughlings Jackson, in a paper published in the *Royal London Ophthal. Hosp. Reports*,⁸ gives two cases of unioocular neuritis from cerebral tumour; one

¹ Whilst reading an account of the illness of Mr. John C. Saunders, author of a posthumous volume entitled “A Treatise on Some Practical Points Relating to the Diseases of the Eye,” published in London in 1811, I noted the similarity of his symptoms, although of an aggravated and more pronounced type, to those seen in this case. The monocular changes in both form and colour-vision, with subsequent partial restoration of sensibility. The general motor and sensory disturbances; “he did not always distinctly feel the ground,” etc. Then the result of the autopsy, where, although the rest of the brain was healthy and firm, “the dura mater adhered firmly to the inner side of the cranium, especially over the right eye; but it was apparently free from disease. The tunica arachnoidea and pia mater were healthy.” This is quite interesting; the situation and position of the adherence confined to the right side over the affected eye; the distinction made between the outer tunic being “apparently free from disease,” and the inner two described as “healthy;” the consideration of the fact of the imperfect methods and instruments for research in those days, and the low grade of inflammatory change they had to deal with, all lend great weight to the conclusion of a very chronic pachymeningitis complicated by tabetic changes. The finding of freshly extravasated blood with softening of contiguous brain-substance was but the post-mortem evidence of the immediate cause of his death—apoplexy.

² Hulke, Royal London Ophthal. Hosp. Reports, vol. vi. pp. 90-93.

³ Norris, Phila. Med. Times, Aug. 30, 1879, p. 565.

⁴ Arch. f. Ophth., Bd. xix. Abth. iii. s. 164.

⁵ Klin. Monatsbl. f. Augenh., Bd. xii. (1874), s. 274.

⁶ A Manual and Atlas of Medical Ophthalmoscopy. By W. R. Gowers, M.D., 1879, London, 8vo. pp. 352.

⁷ Ibid. pp. 272, 273.

⁸ Arch. f. Ophth., Bd. xii. Abth. ii. s. 100.

⁹ Vol. vii. p. 573, “Observations on Defects of Sight in Diseases of the Nervous System.”

having been previously reported by Dr. H. Pagenstecher);¹ Jackson's case being one of left-sided neuritis with left hemiplegia, the autopsy revealing a large tumour in right cerebral hemisphere. Jackson considers the occurrence "very rare," and thinks that the morbid growth is almost always situated on the opposite side from the optic neuritis. This last observation has been partially confirmed by the experiments of Dr. Norris² in injecting fluids through the lower lateral corner of the anterior fontanelle of dead-born and older children, in which he usually succeeded "in filling the subvaginal space of the nerve on the opposite side of the head more completely than that on the same side."

Other cases have been either mentioned or reported by Reich,³ Bouachut,⁴ Wells,⁵ Jeaffreson,⁶ Noyes,⁷ and Pooley.⁸ Field gives⁹ an interesting case of brain-lesion with hemiplegia on the same side and unioocular neuritis on the opposite side. In this instance the left eye was the one affected. Careful reading of the second of "Two Cases of Unioocular Amaurosis," a paper written in 1866, by Jonathan Hutchinson,¹⁰ causes me to think that it was dependent upon a previous neuritis; yet I give it with no certainty, merely worthy of doubt. He cites, in a previous paper¹¹ contained in volume four of the same journal, the study of a number of amaurotic eyes, in which a few of them, especially cases one, three, and fourteen, may with reason be thought to have been the resultants of consecutive neuritis from nerve-sheath filling. Hulke, in a paper entitled "Cases of Neuritis Optica, Neuro-Retinitis, and Retinitis,"¹² publishes some thirty-nine cases, with remarks; among which several, notably numbers thirteen and fourteen, may be taken as fair examples of the unilateral type of this class. Magnus¹³ and Pieuzal¹⁴ are said to have also reported cases.¹

¹ Roy. Lond. Oph. Hosp. Reports, vol. vii. (1871), p. 130. "A case of glioma in the left hemisphere, whilst left optic nerve intact."

² Referred to on page 567 of the Phila. Med. Times, Aug. 30, 1879.

³ Klin. Monatsbl. f. Augenh., Bd. xii. (1874), s. 274. Zur Statistik der Neuritis Optica bei intracranialen Tumoren (aus eines Abdr. im militär. Journ. (russisch), Juli, 1874).

⁴ Ophthalmoscopie Médicale, 1876, p. 142. Referred to in Noyes' Treatise.

⁵ A Treatise on the Diseases of the Eye. By J. Soelberg Wells, 1883 (Fourth Amer. ed.), p. 559. No particulars given.

⁶ The Lancet, London, March 8, 1879, p. 320.

⁷ Treatise on Diseases of the Eye, 1881, p. 307. Merely mentioned; no history given.

⁸ Archives of Ophth. and Otol., vol. v. p. 148. Tumour on the same side as neuritis.

⁹ Brain, vol. iv. (1881), p. 247.

¹⁰ Royal Lond. Ophth. Hosp. Reports, vol. v. p. 185.

¹¹ Report on cases of amaurosis from intracranial causes, in which one eye only was affected, p. 235. Vide a series of thirteen cases by same author on pages 316, 320, in volume 9 of same reports.

¹² Royal Lond. Ophth. Hosp. Reports, vol. vi. p. 90.

¹³ Vide p. 307 of A Treatise on the Diseases of the Eye, by Henry D. Noyes, A.M., M.D., 1881, 8vo. pp. 354. ¹⁴ Loc. cit.

¹⁵ See details of a probable case on page 120 of vol. ii. of Tyrell on Diseases of the Eye, London, 1840.

That this case may with propriety be added to the number, I think there cannot be any question, as I saw the patient immediately after the attack, and watched him periodically to the time of this writing, therefore not allowing any passing symptoms to escape; and besides, which is of the utmost importance, there were not and are not any evidences in his good eye of past inflammation. The fact that the arteries and veins are normal in comparative size, calibre, colour, course, and shape; no appearance of pre-existing splotches or hemorrhages; nerve, although exceedingly dirty red-gray, not prominent or depressed; vision for form normal; accommodation fair; peripheral and central colour-perception very good for his time of life; all cause me to throw out the idea of past neuritic inflammation on that side.

There might be many theories given to account for the cause of this one-sided choking, but of all I think but two are in any way tenable.

First: That there is a circumscribed chronic pachymeningitis in the left anterior and middle fossa; idiopathic in type; creeping backwards outwardly; involving a few of the nerve-sheaths at their foramina; producing œdema in their subvaginal spaces, with consecutive neuritis and partial atrophy. No selective action for the attack upon the nerve, merely accidental, dependent upon the course of the progress of the disease.

Second: That there is a new growth, very chronic in its development and course, situated in any part of the brain, causing increase in the formation of arachnoidal fluid, with pressure in all directions, and accidental passage of the lymph through a few of the weaker foramina into the nerve-sheaths, producing incomplete choking of the nerve involved, which in some few instances has caused consecutive inflammation with partial atrophy.

Colour-blindness.—By reference to the clinical notes it will be seen that, besides the first, there were two examinations of the left eye made with Holmgren's wools. One, eight months after the choking, and the other, two and a half months later. The first determination showed entire loss of green, with partial perception of red, whilst violet had much of its red thrown out. Blue and yellow both good. The second gave entire absence of green, red, and blue; yellow still faintly persisting. This was dependent upon several conditions. First: The nebula on the cornea, hardly worth mentioning as it would merely dull the intensity of the colour, just as if a normal eye would attempt to appreciate a colour through a slight mist or a light fog. Yet I do mention it to show that it has been taken into account, and was considered of sufficient importance to modify a definite comparison with the opposite organ. Second: Pressure, with consequent tissue degeneration. Third: Sanguineous extravasation in the macular region. Fourth: Deficient blood supply to the retina. Fifth: Subsequent tabetic change.

The study of the loss and changes of colour in the left eye is extremely

important, because they were noted from the beginning, and the different passing phases so accurately defined, that delicate and almost absolutely correct answers were gotten in reference to the degree of absorption of the hemorrhages, and the amount of return of the viability of the damaged nerves. There remained at the acme of the choking nothing but shadings and gradings of grays. (The yellow-blue sensation of light in looking at a white object I am almost convinced was purely subjective, yet not to be too dogmatic in the assertion of positive achromatopsie, I will merely assert xanthokyanopie,¹ as this does not interfere with the study of the case.) The conducting fibres were pressed upon, and the receiving fibres buried under a semi-opaque substance, hence their physiological actions were reduced to a minimum, and almost total annihilation of colour-perception the result; the amount of remaining colour being the exact equivalent of the amount of remaining power. This was the primary acquired colour-blindness, totally different from the secondary acquired colour-blindness dependent upon secondary nerve change through consecutive nerve-tissue inflammation; the former, capable of amelioration, and the latter incurable. All this was the result of the localized pressure upon the nerve with its consecutive atrophy, totally distinct from the tabetic changes which came on later; the nerve having had super-added to its atrophy from pressure and inflammation a true gray degeneration like that in the right optic nerve causing a greater amount of atrophic change, with a proportionate relative lessening of colour-vision.

To save time and space I have combined my study of the grouping of the colour-symptoms into a series of definite conclusions which I think may be applied to all similar cases.²

1. In optic-nerve choking, there is a primary acquired colour-blindness; the amount dependent upon the amount of oedema and its immediate consequences.
2. There is a gain in colour-perception after the occurrence of the primary form of colour-blindness, the amount being directly dependent upon the amount of restoration of physiological ability of the diseased nerve-tissue.
3. There is a secondary acquired colour-blindness, coming on after the

¹ Mauthner's definition of yellow-blue seeing. "Vorträge der Augenheilkunde" von Dr. Ludwig Mauthner, 1879, Heft 4, s. 179. (Farbensinn.)

² The colour-vision of the right eye having merely gotten to the very early stage of dyschromatopsie, I am unable to give any rules from this case as to the order of loss of colour dependent upon the tabetic condition. Erb states that in locomotor ataxia green goes first, then red, finally yellow and blue. Charcot says that the perception of yellow and blue persists in a high degree and for a long time. The fact that this experience of these two observers, in cases of tabes, does not materially differ from my own in the observations made upon the left-sided choking with its atrophy in the case before us, together with the comparative study of the visual fields, makes me think that the order of loss of colour-perception is the same in each form.

intermediate gain, the result of inflammatory tissue change or degeneration which lessens physiological action to an equivalent with the amount of nerve-tissue left.

4. The secondary form is incurable, and either remains stationary, or passes on to total colour-blindness.

5. In both the primary and secondary forms of this variety of acquired colour-blindness, green followed by red is the first colour to go; then blue, and lastly yellow.

6. The gain in colour-perception, after primary acquired colour-blindness, takes the following order: yellow, blue, red, and green.¹

7. Definite conclusions in reference to the amount of physiological power (physical condition) left after the cessation of optic nerve pressure and consecutive inflammation may be gotten by average comparison of a number of similar cases.

8. These conclusions have no bearing upon cases of simple degeneration of the optic nerve, as in this form of the disease; there cannot be any distinction drawn between a primary and a secondary colour-blindness, there being nothing more than a progressive colour diminution, passing through the stage of dyschromatopsie, and terminating in total colour-blindness.

It is very important to note the comparative changes in the extent and kind of the peripheral form and colour vision of the two eyes. The almost utter annihilation in the left eye of form and colour fields; the gradual gain in the amount of area and the number of colours seen; their order of progression; the forms of the fields and their relative sizes, when the nerve had gained its utmost; the secondary contraction, and the final changes in the colours themselves. The contraction of the fields of the good eye, with no change in colour, showed slight, but progressive degeneration.

I shall not enter into the reasons of my expunging all other forms of the cause of these changes than those given, but shall briefly summarize the past and existing conditions, and from these add strength to my previous deductions. In the left eye, the primary reduction to light perception; the intermediate gain, which for yellow and blue came back, in areas and kind, equal to that of the good eye; the area for red, when the nerve was its best, equalling about one-fourth the size of that in the right eye, yet the colour never called anything but pink; green never regained; form field as good and as large as its fellow. The secondary loss, shown by the marked contraction of all of the fields, as compared with that during the intermediate gain; and the change of the pink (red) field to the mixed one, containing a central "dirty-brown." In the right eye, the slow, pro-

¹ See note of a case by Chisholm, Roy. Lond. Oph. Hos. Rep., vol. vi. p. 214.

gressive concentric contraction of the form and all the colour-fields, with no observable changes in the colours themselves.

Careful study of these conditions has led me to a few conclusions:—

1. In optic nerve choking, with subsequent atrophic change, the visual fields for form and colour pass through three distinct phases: first, a primary loss of extent and kind; second, an intermediate gain; third, an ultimate loss.

2. In simple degeneration of the optic nerve, there is merely a diminution in the areas of the form and colour-fields, with decided and definite changes in the colours themselves, from the very beginning.

3. The fields of secondary change from œdema (Stauungs-papilla) are exactly the same as those of any simple degeneration of the optic nerve, provided the tissue change exists in similar places.

4. In every degenerative change (equal in transverse section¹) of the optic nerve fibres situated anterior to the chiasm, there is always a concentric and relative limitation for both the form and colour-fields of the side involved.

5. To have concentric and equal contraction of the visual fields in degeneration of both optic nerves, the degenerative process must involve equally in transverse section both trunks anterior to, or posterior from, the chiasm, or the entire chiasm itself; although these degenerative spots need not occupy similar positions.

The investigations which were pursued with central colour-perception are well worthy of note. Commencing in the left eye with candle-light perception, appearing as a yellowish body at five metres' distance, I found that in three weeks the various colours had partially regained themselves; curiously, first appearing as "sparks of fire." Red perception (always called pink) reduced to one-eighth, as compared with the other eye; green never regained, merely turned blue; violet, designated as pink, with a yellowish cast; blue about as good as its fellow. Yellow not taken at this time. At the third examination made seven months later, I found that there had been a marked decrease; red, which had been a "good pink," had faded to a "light pin fire," becoming darker upon greater exposure, and at last passing into "lead-colour;"

¹ It may be observed that I use the expression "equal in transverse section." This I do intentionally, not meaning equal in any one narrow zone, but that there is, by the time we have reached the intra-ocular tip from the point primarily involved (or *vice versa*), an atrophy equal in all parts of the entire nerve distribution to the retina. Thus, there may be zones and girdles of degeneration, or even insulated scleroses, which, if taken all in all, become evenly distributed across the entire nerve or nerves, and produce equal and concentric narrowing of the visual fields. This reasoning cannot in any way conflict with the researches of either those who hold to partial decussation, or those who believe that the decussation of the optic nerve fibres in the chiasm is complete.

green had lost its blue tinge, appearing as varying "sparks of fire," getting brighter and lighter as more surface was exposed; violet appeared as "a yellow spark of fire," becoming lilac;¹ blue diminished to mere "fire spots"; yellow recognized as "lemon colour." Although central colour-perception was deficient in the patient's right eye at the first visit, there was a gradual lessening of power without any change of colour.

Study of these conditions only adds confirmation to the conclusions arrived at in the researches with the coloured wools and the visual fields; showing that this modified method of examination is absolutely under the same laws as the others, having the same changes, and passing through similar phases. Hence, the former conclusions will also hold good in this series of observations; it being my belief that such experiments serve as indices for the exact estimation of the amount of optic nerve tissue changes.

Smell.—At first sight, this symptom appears to complicate the case, but I think, if careful survey be made of the patient's past history, together with proper appreciation of the existing conditions, we not only tend to lessen its seemingly complex nature, but really add strength to the hypotheses brought forward early in the paper. The patient said that he had noticed difficulty in smelling on the left side for twenty years past, dependent, he thought, upon his left nostril not being so free. That there may have been obstruction in the canal, I in no way deny, and that the defective smell was a mere factor in a chronic catarrh, I do not doubt; but I am positive that when I examined him, and that not only once, but repeatedly, I could not distinguish, as far as I was able to see, any change in the mucous membranes, or a marked difference in the calibre of the canals; and that air was ejected through the left side with the same force as through the right. Not only these facts, but his present recognition of the decided difference in the power of the sense on the two sides, which I confirmed by experiment, all made me seek further for the entire cause of the trouble. The objections that might be brought forward to my thinking the cause of the disorder of smell as intracranial are of little weight, because the two conditions could have been co-existent. The local changes having undergone resolution with restoration of the parts involved to their normal condition and action; whilst the intracranial disease still persisting or forming gave the same loss of physiological actions as heretofore.

We all know that loss of smell may arise from several causes, prominent among these being deformities and inflammation of the nasal appendages themselves, such as acute and chronic thickenings with adhesions of the mucous membrane, polypi, bone lesion or paralysis of some of the super-

¹ This is very curious, yet I give it as expressed by the patient, although I do not think it militates in the least against the order of loss and gain, as he may have seen some of the pink in the violet, and this, combined with his yellow vision, has given him a vague and imperfect impression of lilac.

ficial muscles.¹ These conditions not existing, made me throw out any notion of a peripheral origin as being the entire cause of the unilateral dyosmia. The question, then, resolved itself into a central or an intermediate lesion. Ferrier,² by comparative experiment, places the centres of smell and taste at the tip of the temporo-sphenoidal lobe. Further investigation has shown that the loss of action is on the same side as the intracranial lesion, owing to the non-decussation of the olfactory paths in the anterior commissure. I do not think that there can be a lesion of these centres in this case, because, as far as I can get any history, or am able to investigate, there has not been, and is not any deviation from the normal in the sense of taste, which would have taken place if we accept Ferrier's and the later views upon their relative situations. Therefore, all that is left for us, is the intermediate tract, and here I think we can confidently locate the trouble : Inflammatory thickening of the dura mater on the left side of the cribriform plate, part and parcel of the more extended thickening. Of course, I can conceive of a cerebral tumour producing almost identical one-sided symptoms.

Reflex Movements.—The entire absence of the so-called "Argyll-Robertson phenomenon" is quite interesting, although the existence of a break in the reflex of a tabetic pupil, when exposed to light, is by no means universal. Jackson speaks³ of a case of tabes dorsalis of seventeen years' duration, in which this symptom could not be found. Gowers broadly asserts that it "cannot, with all our care, be invariably obtained in persons beyond middle life."⁴ This latter assertion I can but re-echo, having seen two patients with well-developed locomotor ataxia, in whom, with the utmost care and patience, I could not get this symptom. Prof. Erb's statistics show but eighty-four per cent., a little over one-half of these being in the preataxic state. Bramwell⁵ is of the opinion that the involved point is probably situated either in the corpora geniculata, or between them and the reflex centre ; the abolition of the reflex being independent of the cord lesion. As far as my own reasoning goes, I cannot see why it should be a necessary factor in all cases ; its occurrence being dependent upon the accidental position of the lesion, somewhere in the arc of reflex action to light.

The abolition of the superficial reflexes was probably the result of three causes : the age of the patient ; pathological changes connected with de-

¹ The right-sided partial immotility of the facial muscles did not seem to give rise to any of these last symptoms, hence my reason for expunging any probable influence from this phenomenon. Had they existed they would have served as arguments against a peripheral cause for the left-sided diminution of smell.

² *The Functions of the Brain*, 1876, 8vo., pp. 323.

³ *The Ophthalmic Review*, July, 1883, p. 213.

⁴ *Ibid.*, p. 212.

⁵ Pages 228 and 229 of "The Diseases of the Spinal Cord." By Byron Bramwell, 1882, 8vo., pp. 300.

generation of the posterior horns of gray matter; and intracranial disease.

The study which I made of the deep reflexes, more especially that of the "patellar-tendon," is valuable in showing a possible primary excitation of the postero-external columns, in the developmental stage of a *tabes dorsalis*, more pronounced on the left side; the nerve tubes in the affected part gradually undergoing degeneration equally on both sides, with consequent equal relative diminution of the reflex action. It may be that the unequal exaggeration was partially due to the cerebral lesion, as I am positive, from what little experience I have had, that in cases of unequal optic nerve atrophy, there is often a marked difference in the "patellar-tendon" reflex upon the two sides. Again, the unequal exaggeration in the myotatic contractions may have been wholly the resultant of the intracranial trouble, which, upon the superaddition of the degeneration of the nerve-tubes in the postero-external columns, has become relatively equally diminished.

The other motor and sensory disturbances point towards the double origin of the disease. The isolated incoördination of the external perineal muscles,¹ and the diminished response of their nerves to the faradic current, together with the rapidly diminishing "patellar-tendon" reflex indicate that the greatest degeneration is in the lumbar cord.

GENERAL REMARKS.

We think we can notice four distinct factors of disease, as being the causes of the patient's present condition.

First. The early appearance in life of a polypoid growth in the right ear, which upon being extracted caused obliteration of the right auditory canal, and destruction of the contents of the middle ear. The partial loss of motility of the facial muscles upon the same side took place at the same time through peripheral traumatism; although this was not of sufficient moment to cause interference with their electrical reactions.

Second. A chronic catarrhal inflammation of the left middle ear, of an exceedingly rare and almost unique type. The peculiarity consisting in the formation and the retention of a sero-mucous fluid within the tympanic cavity, which required frequent evacuation; each operation productive of a marked increase in audition. The tendency to the accumulation of the liquid, at last ceasing, with a return of the power of hearing to a relatively normal standard. This was purely local in origin.

Third. This conclusion is divided into two probable conditions, there not being any proof of an individual or a combined existence.

4. A chronic pachymeningitis, limited to the anterior two-thirds of the left base, involving a few of the nerve-sheaths at their foramina; causing subvaginal oedema, with consecutive neuritis and partial atrophy.

¹ First pointed out in 1875, by Dr. J. Hughlings Jackson.

B. A new growth, very chronic in its development and course, situated in any part of the brain. The neoplasm causing pressure in all directions, with accidental passage of arachnoidal fluid through a few of the weaker foramina into the outgoing nerve-sheaths; this serous exudation producing incomplete choking of the nerve, followed by inflammation and atrophic degeneration.

Fourth. Sclerosis of the posterior columns of the spinal cord; the disease having advanced as far as the beginning of the stage of full development, without complication or extension of morbid process.

not directly interfering with any motor or sensory nerve-structure.

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